

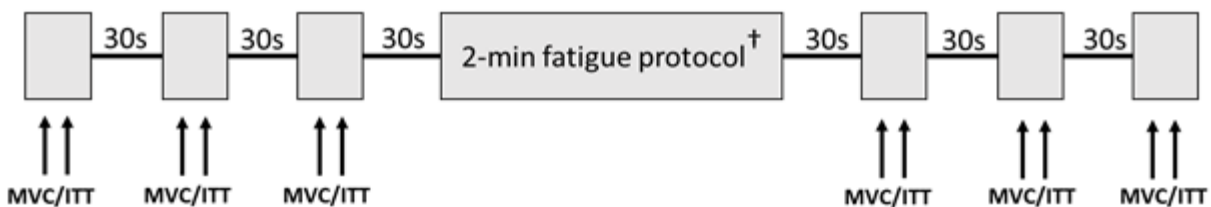
Figure S1. Knee extensor strength, voluntary activation, and fatigue protocol. Both legs were tested in a randomized order (coin flip).

Abbreviations: MVC = maximum voluntary contraction; ITT = interpolated twitch technique.

MVC/ITT = 3-second maximum contraction paired with stimulation of the femoral nerve

(Doublet; 0.5-ms pulse width; 80 Hz) during the MVC and 5 seconds during rest. 30 seconds of rest was given between tasks.

[†] Single sustained isometric MVC of the knee extensors with knee angle of 80 degrees.



Appendix S1. Detailed Protocols for Secondary Outcomes

Physical Performance

Timed Up and Go (TUG) Test. Independent functional ability was assessed via the TUG test.¹ We chose to perform the test with both right and left turns (once per side) because this would account for known imbalances that exist in persons with MS. Participants were instructed to stand up, walk to the turnaround mark, perform turn as indicated (ie, left or right), then walk back to the chair and sit down as quickly but safely as possible while using their typical assistive devices. The timer was started when the participant initiated movement to stand up and stopped when the participant had come to a complete seat.¹

Fullerton Advanced Balance Scale (FABS). Balance was assessed via multidimensional FABS composed of 10 balance test items that evaluate different systems and mechanisms contributing to balance.² The test items are graded on a 5-point ordinal scale (0-4), with a higher score indicating better performance (maximum score of 40). Standardized instructions were read to the participant and a demonstration given prior to the participant initiating each of the 10 test items.²

Sit-and-Reach Test. Flexibility, as well as core stability, was assessed via the sit-and-reach test. Participants were first seated and led through a 30-s standardized hurdler stretch prior to completing the assessment. After the warm-up stretch participants were instructed to sit with legs outstretched, feet up against the apparatus, with one hand aligned on top of the other hand, and fingertips placed at the end of the block on the apparatus. After taking a deep inhale, participants slid the block down the meter stick of the apparatus as far as possible while exhaling and maintaining control. A total of three attempts were given and the mean calculated.

Body Composition

Dual-Energy X-ray Absorptiometry (DXA). Body composition, including fat-free mass (ie, lean mass), fat mass, and percentage body fat, was assessed via DXA in array mode (QDR Discovery Wi; Hologic, Inc., Bedford, MD) using QDR software for Windows XP (QDR Discovery). The coefficients of variation for lean mass and fat mass in our laboratory are 1.0% and 3.0%, respectively.³ The total body scan was performed by a blinded study radiologist.

Muscle Strength and Neural Activation

Plank-Hold Test. Core endurance was assessed via the plank-hold test.⁴ Researchers demonstrated a proper forearm plank position and indicated to participants they should hold this

position as long as possible. The test was terminated when the participant voluntarily stopped the test due to fatigue, or when technique faltered and remained uncorrected after two consecutive corrective cues from the researcher.⁴

Maximum Voluntary Contraction (MVC) with Interpolated Twitch Technique (ITT). Knee extensor strength and voluntary activation was assessed three times before and after a 2-minute fatiguing task via isometric MVC with ITT (Figure S1) while participants were seated in an upright position on a dynamometer (Humac Norm, CSMI, Stoughton, MA). A Constant Current High Voltage Stimulator (model DS7AH, Digitimer, Hertfordshire, England) with 5.08-cm-diameter Dermatode HE-R electrodes (AMERICAN IMEX, Irvine CA) were used to deliver a supramaximal current (mA) required to reach maximal resting twitch torque plus 10% via stimulation of the femoral nerve. The cathode electrode was placed in the femoral triangle while the anode was placed in the gluteal fold. The skin surface was alcohol swabbed and shaved as necessary. A low level of current was used to determine the electrode placement and was gradually increased until a plateau in resting peak twitch torques was observed. Torque values were recorded on a separate computer using custom-built LabView software (Version 8.6; National Instruments, USA) with a 1000-Hz sampling frequency. Calculations for voluntary activation and peak torque were completed using custom routines in MATLAB. A fourth-order low-pass Butterworth filter with a 100-Hz cutoff point was used for all torque data.

Descriptive Outcomes

Accelerometers. Objective daily and weekly physical activity was assessed via Actical accelerometers.⁵ Accelerometers were programmed to record 7 days of activity with the epoch length set at 0.25. Participants were instructed to wear the monitor on their right hip during all waking hours, except during activities performed in water (eg, bathing, swimming), and to complete tracking logs provided.

Questionnaires. Quality of life was assessed via the Multiple Sclerosis Quality of Life (MSQOL)–54 instrument.⁶ Disability status was assessed via the Patient-Determined Disease Steps (PDSS) scale,⁷ which is strongly correlated with Expanded Disability Status Scale (EDSS) scores.⁸ The PDSS scale was chosen in lieu of the EDSS because most participants were unaware of their EDSS scores.

Adverse Events (AEs). Pilates instructors and massage therapists monitored participants for AEs during therapy sessions. Participants were further questioned regarding AEs that

occurred outside the study sessions at each visit. If applicable, AE forms were filled out with a brief description of the event and details involving the onset and resolution dates, rating for severity, and relationship to the intervention.

References

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